



Time change and Correlation analysis of Nalsarovar Lake

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ABSTRACT

Lake Nalsarovar water level has fluctuated during many years. The paper deals with the investigation of water level data in the period of 1990-2010. To evaluate the changes in patterns based on time, data characteristics and temporal change analysis. The data sets are taken for the satellite images, which help us in analysis of change in patterns. The major aim of this study was to test if it is possible to estimate former changes in the spatial extent of Lake nalsarovar using three sets of satellite imagery from the GLS database (Satellite data (images) covering Lake nalsarovar for three time periods (LANDSAT 5)) were used as data source. During the period 1990-2010, the water level in the lake declined by about 11%. The findings of this current study contribute relevant data to future research developing a hydrologic model for the Lake Nalsarovar basin. The results of this study could also provide a useful tool to local stakeholders (e.g., Lake Nalsarovar Basin Commission, policy makers, national and international NGOs, World Bank and the African development bank) for decision making in the field of water management and agricultural policies, irrigation water distribution and drought management. Results show that there is a significant decreasing trend in water level and the beginning of the change point is 1990. Need of conservation measures is required or soon the wetland will diminish to wasteland.

KEYWORDS : Lake Nalsarovar, GLS data, water level change, time change, NDWI (Normalized difference water index)

INTRODUCTION

Nalsarovar lake has been now included as a wetland in Indian list in 2012. Area covered by Nalsarovar Lake is of 123 km² and is located 64 km from Ahmedabad.

Nalsarovar lake Largest wetland bird sanctuary in Gujarat and one of the largest in India. The area is home to 210 species of birds, with average 174,128 individuals recorded there during the winter and 50,000 in the summer. It is a home to endangered wild ass and the black buck, with a migratory Rosy Pelicans, Flamingoes, White Storks, Brahminy Ducks and Herons forming major attractions mainly inhabited by migratory birds in winter and spring.

DATASETS

The images below are taken using the satellite. The data used for the satellite images is GLS data. To observe the change in water level in the lake the three temporal points for dataset – 1990, 2000, 2010 are selected. The interval of 10 years is taken. There was no decrease in amount of rainfall. All the images are taken from the satellite in month of October. The following points of path and row make clear the position of satellite images.

**WRS Path: 149
And WRS Row: 44**



Sources: www.googleearth.com

To analyze thoroughly the water level change with time a 4-5-3 layer stack were used since this results in very clear land boundary interfaces. As an attempt to measure the water extent, it is very useful

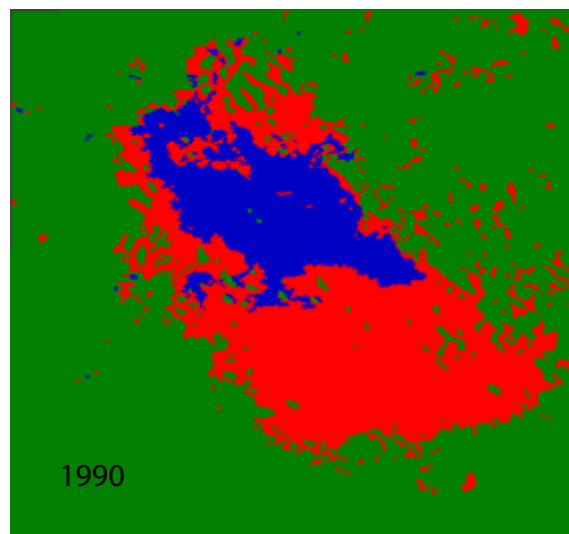
GEO-LINKED the images in vertical two-pane views

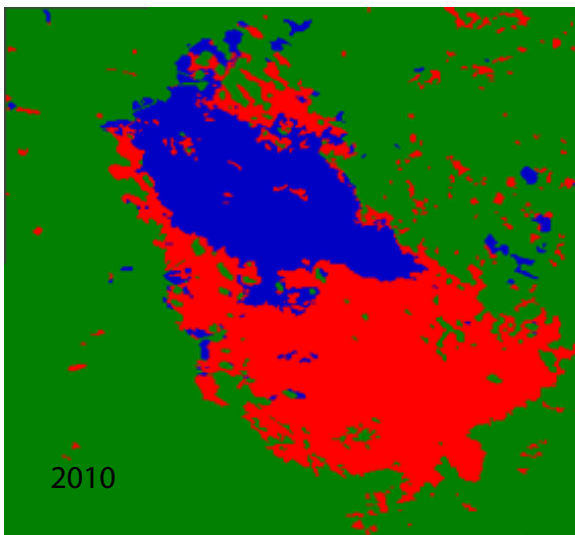
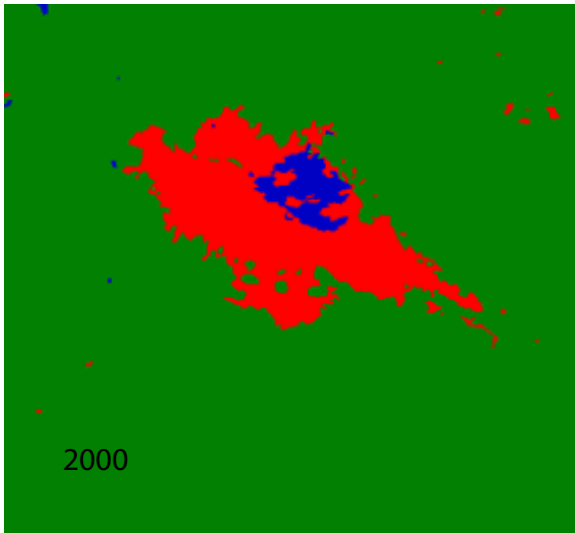
The image was subjected to a dark object subtraction to get rid of the atmospheric errors

The Vector files were generated and then the conversion of Vector -> ROI was carried out.

Further there were conversions of files ROI -> shp

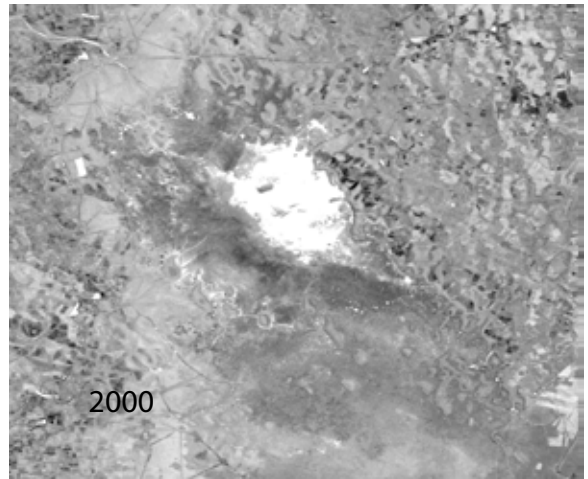
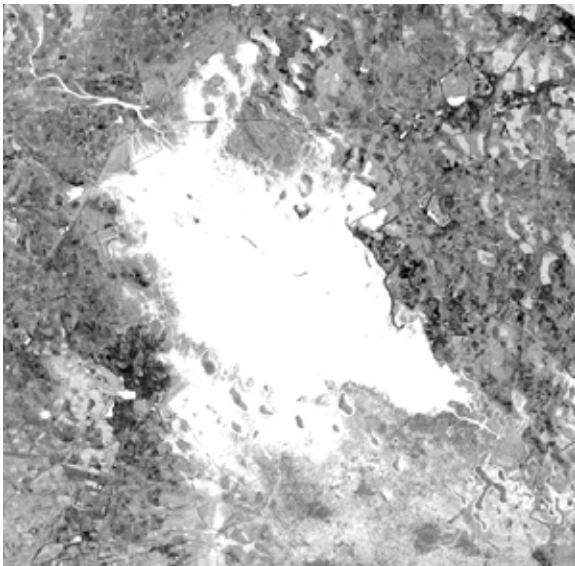
The following satellite images (with their period) show a clear and broader picture of the scenario.





NDWI

$$NDWI = (Green - NIR) / (Green + NIR)$$



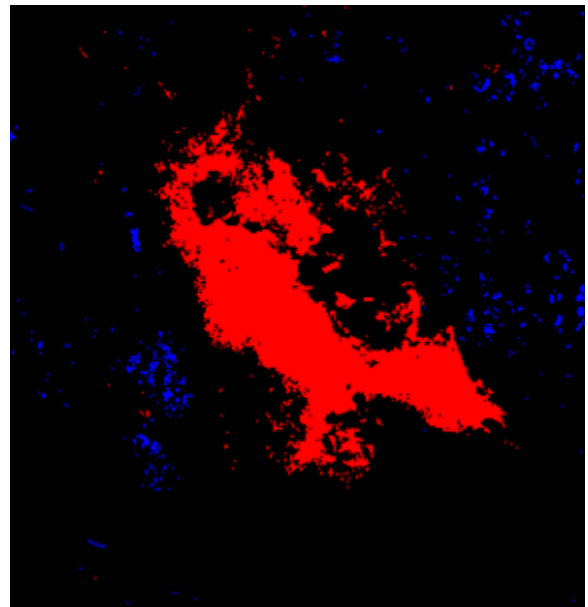
The above images show us the delineation in water level and the decrease in extent of the lake area.

Now we get a much clear idea of the analysis done to obtain the results in a time period.

IMAGE DIFFERENCE USING NDWI

The Normalized Difference Water Index (NDWI) makes use of reflected near-infrared radiation and visible green light to enhance the presence of such features while eliminating the presence of soil and terrestrial vegetation features.

We can visualize the change in the body by using Image Difference between time points

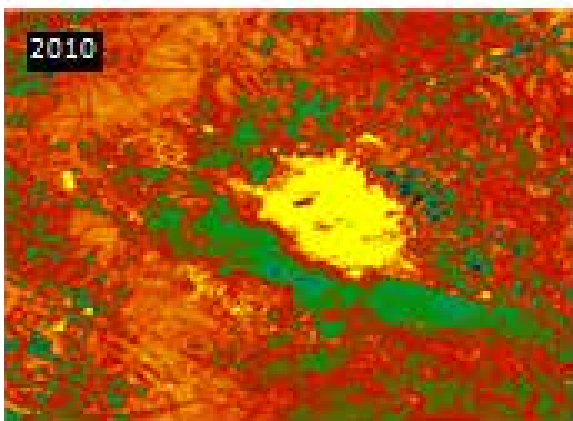
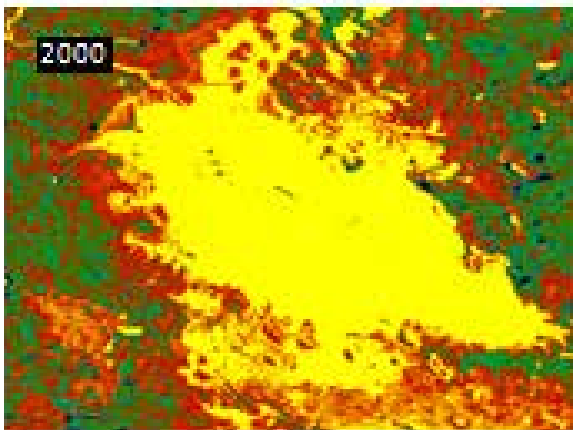
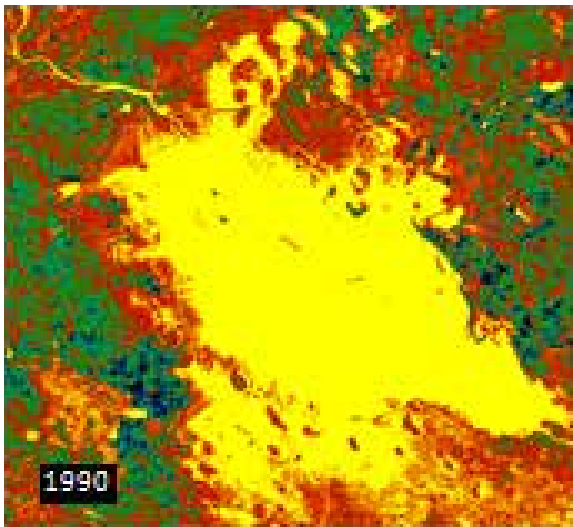


- Red indicates decrease in value
- Blue indicates increase in value

After exploring the resulting grayscale NDWI image, it becomes apparent that there is a threshold near zero where values above the threshold are water and those below are land and cloud. While this data is alone sufficient for analysis, we use something more colorful for visualizing the output.

One can hence use Raster color slices for better visualization. Warm colors (reds and yellows) indicate water and cool colors (blues and green) indicate land/cloud.

Change in colour table



Conclusions

There has been a definite decrease in the water value levels about 11.35% from 1990-2010 and 8% from 2000-2010 and 2% from 2010 till date.

The NDWI that is normalized difference water index classification is giving very clear delineation and very accurate representation. Change Detection also corroborates the decrease in water boundary and extent. Quantifiable change obtained in sudden decrease from 2000 to 2010

The wetland area has decreased drastically and conservation measures are required to safeguard the water level and its extent.

REFERENCES

All the images taken in the analysis procedure are from the Google earth website | i.e. www.googleearth.com | The images are taken from Landsat5 satellite | Analysis of hydro-climatic conditions and water use data in Lake Chad Drainage Basin, by Almeheim A. (2009), | Ghaffa, A. (1998), Monitoring the agricultural landscape: An integrated approach of maps, aerial photographs and geographic information system. |